The Mining Journal

London, March 31, 1961

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America's New Aid Plan

THE Development Assistance Group met in London this week to discuss problems of aid to underdeveloped countries. The creation of this new international body about a year ago reflected both increasing readiness on the part of the more advanced countries to accept the principle that greater strength implies new responsibilities for promoting the economic growth of underdeveloped countries, and Washington's efforts to spread the aid burden more widely as one means of easing America's and Britain's balance of payment difficulties.

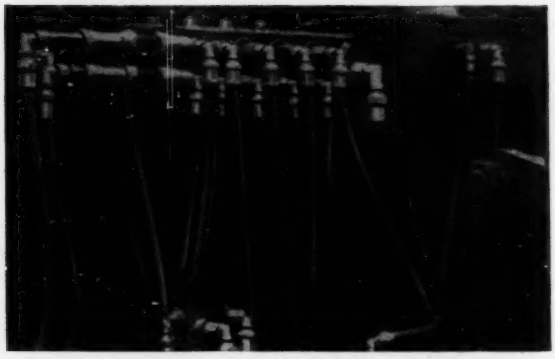
The most important item on the agenda of the London conference was a plan submitted by the U.S. Under-Secretary of State for Economic Affairs, Mr. George Ball, whereunder each contributing country would undertake to provide not less than 1 per cent of its gross national product in economic assistance. In this connection it is noteworthy that, taking government and private investment together, approximately 1¼ per cent of Britain's national income (amounting to some £2,500,000,000) has gone to underdeveloped countries since the war. This figure was given to the U.N. Economic Commission for Asia and the Far East by the Duke of Devonshire, Parliamentary Under-Secretary for Commonwealth Relations, who emphasized that demands on Britain's resources to help under-developed countries were growing faster than the resources themselves.

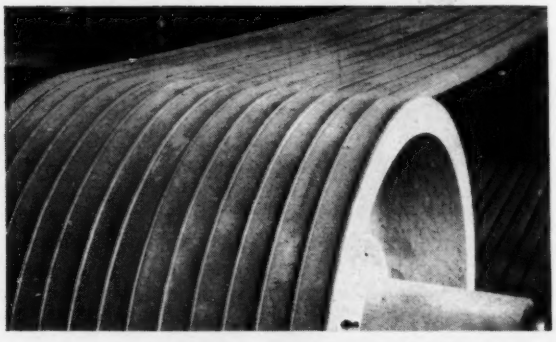
President Kennedy has asked Congress for authority to launch the U.S. on a revolutionary foreign aid programme, involving a new omnibus aid agency with power to draw as much as $7,300,000,000 directly from the Treasury over the next five years for long-term development loans abroad. Hitherto Congress has insisted on annual authorizations and appropriations. A novel feature of the plan presented to Congress, and of Mr. Ball's proposals to the Development Assistance Group, is that America's own contributions to the underdeveloped nations would be dependent on the efforts of the recipient countries to put their own house in order, priority being accorded to those which are prepared to undertake the necessary economic and financial reforms and to formulate realistic development plans.

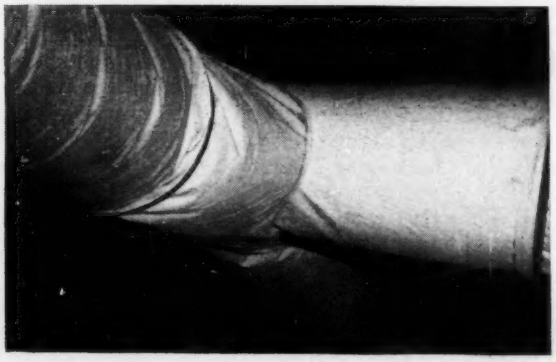
As proposed by Mr. Ball, balance of payments conditions would be provided for by making "untied" loans at low or nominal rates of interest as a general rule, but allowing countries with payments deficits to tie their aid. The effect, in the present circumstances of international finance, would be that loans from the Germans would have no "strings" attached, whereas Britain and the U.S. would be allowed to tie their aid to purchases in their own countries. Should the relative strengths of world currencies change, so; too, would the obligations of the contributing countries.

On the 1 per cent basis envisaged by the American plan, world contribution to economic aid would amount to not less than $8,000,000,000, of which the U.S. would provide $5,000,000,000.

BTR PRODUCTS FOR THE MINING INDUSTRY







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According to a report presented by Mr. Thorkil Kristensen, secretary general of O.E.E.C., the net flow of capital to underdeveloped and multilateral agencies during 1959 amounted to $6,847,000,000 of which $4,178,000,000 was in the form of government grants and loans, $2,178,000,000 in private investments and credits, and $493,000,000 in contributions to multilateral agencies. To the O.E.E.C. total the U.S. contributed $3,032,000,000, France $1,360,000,000, Germany $805,000,000, and the U.K. $722,000,000. During the period 1956-59, underdeveloped countries also received $150,000,000 a year from Japan, $140,000,000 a year from the Sino-Soviet *bloc*, and $40,000,000 a year from other countries.

The private aid figures for O.E.E.C. countries include direct investment, much of it in the extractive industries, as well as reinvested earnings and guaranteed export credits. Mining, being basic to all economic development, has unquestionably been among the major beneficiaries from the flow of public capital into underdeveloped countries, not only through expenditure on minerals exploration and the expansion of extractive and metal processing industries, but also indirectly through the construction of hydro-electric undertakings, railways and harbours, and other engineering projects essential to the exploitation of new deposits. It is evident, too, that this enormous outpouring of financial and technical assistance must have been a factor of major importance in the growth of world demand for metals and minerals.

Initiated on comparatively simple and straightforward lines, Marshall Aid has snowballed into a worldwide channelling of funds from the "have" to the "have-not" countries, which has become no less indispensable to the prosperity of the manufacturing nations than to the improvement of living standards in the less highly developed regions. Yet the flow of capital into underdeveloped countries has not been the result of an overall plan or subject to central control. Like Topsy, it has just "growed". Mr. Kristensen describes it as being the end result of decisions taken by a multiplicity of governments, parliaments, institutions and officials, as the result of numerous individual negotiations and agreements. As specific new needs appeared, new arrangements and appropriations were made to cater for these needs.

It is not surprising, therefore, that the present picture is one of considerable complexity. The sources of public capital as well as its forms have become more numerous and more diversified. Correspondingly, in recent years an increasing desire has been felt to bring the different forms, sources and institutions involved in the flow of public capital together in more concerted action, so as to take advantage of their mutual specialities and interactions. This desire for better co-ordination has found expression, states the report, in the development of "package deals", in advance determination of the needs of individual countries for public capital assistance for some time ahead, concentration of public aid on "strategic" sectors, new consultative and co-ordination machinery, and a desire to place individual aid transactions under some form of general "umbrella".

The desire to concert action in this field has not been confined to public aid alone; in many different forms, the flow of public capital to underdeveloped countries has been intermingled with flow of private capital, and government policies to encourage appropriate flows of private capital have gone hand in hand with, and are sometimes difficult to disentangle statistically from, the flow of public capital. As illustrations of the more recent tendencies to intermingle private and capital flows, the report cites the development of export credit machinery, of investment guarantees, of private participations in public loans or investment, the establishment of semi-public corporations, and the raising of private subscription capital for public institutions investing in underdeveloped countries.

Such is the complexity of the existing network of channels that, as announced by the Prime Minister recently in the House of Commons, a new Government Department is to be created in the United Kingdom which will be responsible for the provision of technical assistance to overseas projects, other than capital projects. Its main responsibilities will be Britain's contributions to the U.N. Expanded Programme of Technical Assistance and Special Fund, and technical assistance expenditure given bilaterally under such schemes as the Colombo Plan, the Special Commonwealth African Assistance Plan, the Foundation for Mutual Assistance South of the Sahara, the Central Treaty Organization, the administration of the Overseas Aid Scheme, and many of the technical and advisory services now carried out by the Colonial Office on behalf of dependent territories. Hitherto, requests for technical assistance have been dealt with through different administrative channels, depending on whether they come from one of Britain's dependent territories, from an independent Commonwealth country, or from a foreign country.

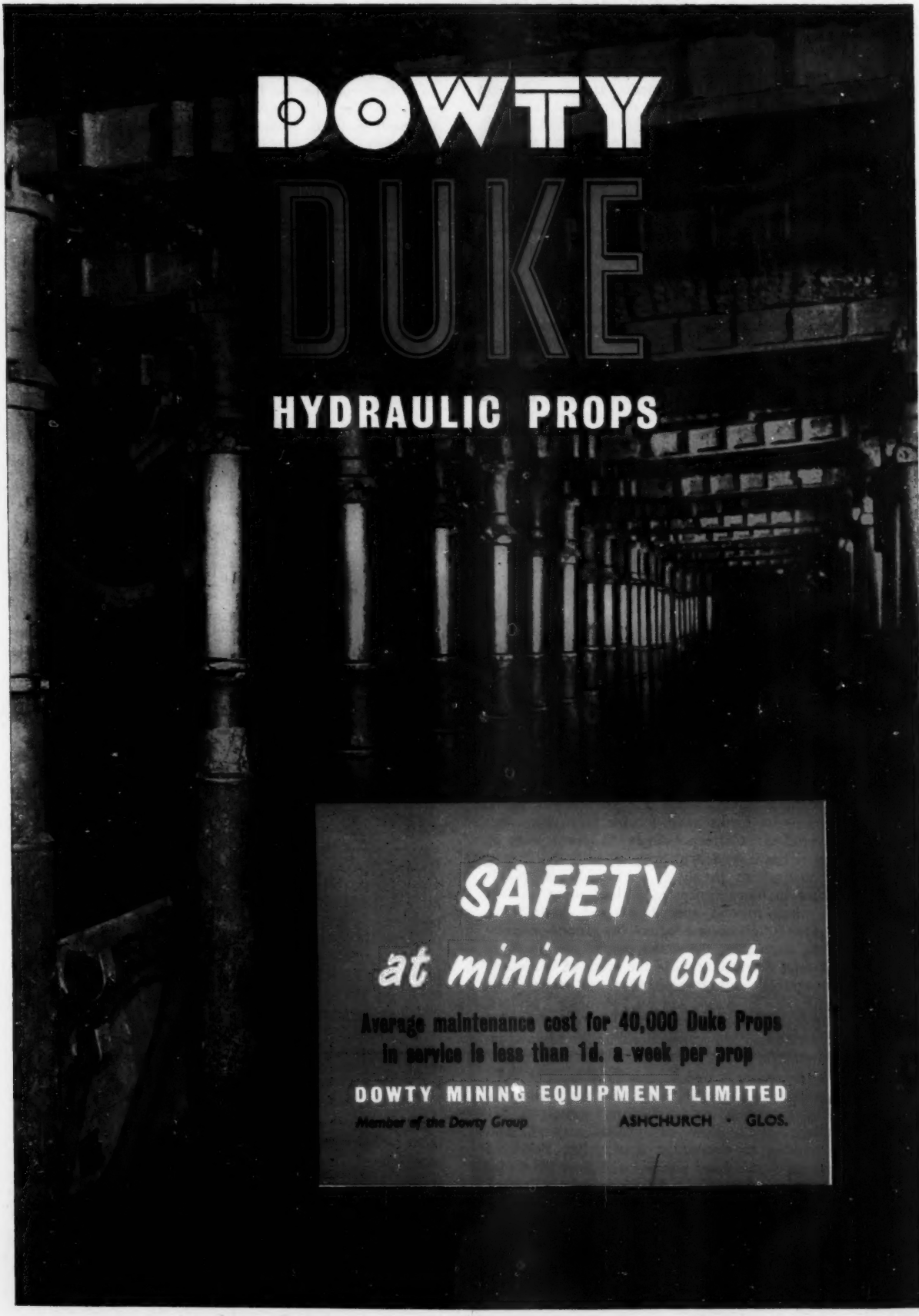
The setting up of a single department to handle all such requests might well contribute to a further improvement in the liaison which has already been established between those concerned with administering our aid programme and those in a position to supply technical know-how and equipment. Irrespective of the reactions of recipient countries to the principle of tied loans, there can, of course, be no question as to the importance of keeping our consultants and exporters fully informed of all developments in our aid programme from the earliest possible stage.

COMPUTERS FOR THE MINERAL INDUSTRY

The use of electronic computers as a tool of management has been rapidly extending throughout many branches of industry and these machines may soon become a commonplace in large mining companies. Preliminary studies have already been made of the usefulness of electronic computers for mine organization and methods (O and M) groups which are concerned with the flow of data and information from the initial production stage to the point of product delivery. Again, they have been studied for use in operational research (O and R) which aims to provide managements with a more precise or hitherto unattainable scientific basis for tackling business problems. O and R relies heavily on mathematics and mathematical statistics, for instance, in problems concerned with ore mixture and draw control, sampling and assaying, grade forecasting and advance planning of mine and open pit ore production. It uses linear programming, which is a computational method that tests, accepts and rejects from a number of different factors to find the best combination, for example, in machine scheduling, batch mixing and ore mixture and draw control. Another O and R tool is queuing theory which has obvious application in finding the optimum use of mine transport.

Of course, O and R techniques resemble good management techniques that have been practised for many years past, for instance budget statistical costing; however O and R is gaining ground because the electronic computer is available to solve problems that simply could not be solved by previous equipment or techniques.

Because of this growing interest, representatives of leading African mining companies will attend a symposium on computers and computer applications in the mineral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industry which will be held at Tucson, Arizona, U.S.A., from April 4 to 7 under the aegis of the Department of Mining and Metallurgical Engineering, College of Mines, in co-operation with the Numerical Analysis Laboratory, College of Engineering, University of Arizona.

The programme will include papers on "the use of computers in equipment analysis" by Professor E. R. Drevdahl, associate professor of mining engineering; "the application of computers to open pit ore reserve estimation" by Mr. R. F. Hewlett, research fellow, Department of Mining and Metallurgical Engineering; "the application of computers to underground ore reserve estimation" by Dr. W. C. Lacy, professor of geology; "the application of computers to metallurgy" by Mr. R. Schenk and Mr. E. Kehr, research fellows; "analog and digital computers in process control" by Mr. R. M. Edwards, instructor in chemical engineering, and "the use of computers in determining pit limits and pit extensions" by Professor T. E. Caldwall, assistant professor of numerical analysis.

BRITAIN'S GROWING IRON ORE NEEDS

British crude steel production in 1960 reached a record of 24,300,000 tons, nearly 20 per cent higher than the year before and 12 per cent higher than the previous peak in 1957. Steel exports of 4,100,000 tons also set a new record. Output of steel this year, said Mr. C. R. Wheeler, president of the British Iron and Steel Federation in his annual speech, may slightly exceed last year's figure and the industry is in a position to push output higher if demand warrants it. Available capacity will reach 27,000,000 tons this year and some 34,000,000 tons by 1965, more than sufficient to meet demand which may reach the 30,000,000 ton mark by then, including about 5,000,000 tons for export. The chief concern now, said Mr. Wheeler, is not shortage but dangers of over-expansion which makes it encumbent on the industry to work vigorously in the home market and to press still harder for bigger exports abroad.

Supplies of ore were ample last year in spite of the high level of demand generated by record pig iron production. Half the supplies were drawn from home sources, half from overseas. Mining of home ironstone reached a post-war peak of 17,000,000 tons some 2,100,000 tons higher than in 1959, and output should rise as a result of extensive programmes now in hand.

The United Steel Companies have invested £1,575,000 in two large baring machines each capable of shipping 30 tons of overburden at one bite, while in addition to two underground mines developed since the war, another mine will start producing this year and a further opencast mine is being developed at Colsterworth.

Stewarts and Lloyds, the other principal ore producer, are planning to instal their third giant walking dragline excavator. Last year these two companies completed a survey of domestic iron reserves in the unexplored part of the Northampton Sand field, north of the river Welland. Smaller producers are also seeking to provide more ore which will be necessary to sustain an expected increase in pig iron output.

Record imports of ore at 17,500,000 tons were some 4,300,000 tons more than in 1959. Most of the increase was needed to sustain higher blast furnace outputs but some went to stockpile, which rose from 2,800,000 tons in January, 1960, to 3,900,000 tons at the end of the year.

With the steady increase in productive capacity the industry is paying more attention to supplies. A long-term contract was concluded last year for the supply of 1,000,000 tons annually from a new development in Liberia and the first shipments are expected this year. On a broader front the British Ore Investment Corporation (B.O.I.C.), formed last year by the nine main iron ore consumers and the British Steel Corporation, took over the investments in overseas orefields previously held by the British Steel Corporation, and has since extended its interest in MIFERMA, the company which has been developing major iron ore deposits in the Republic of Mauritania and is expected to start commercial deliveries at the end of 1963.

By the end of 1960 the industry had 62 ships in operation, almost twice as many as at the end of 1958 with almost double the carrying capacity, and all were fully employed throughout the year to meet the demand for foreign ore. Sweden continued to be the industry's largest supplier of ore but the trend towards heavy imports from Canada and South America was still in evidence. Russia remained the principal supplier of manganese followed by South Africa and India.

The British Steel Corporation still holds the industry's investments in ore shipping companies and a further 12 vessels were added during the year to the fleet of special ore carriers. The coporation has a capital interest in 27 of the total of 62 ships.

The desirability of increasing the capacity of some of the carriers remaining to be built is under careful consideration. This year a 24,000 ton ship is to be commissioned and altogether four of the ships coming into service in 1961-2 are to be of about the same tonnage, but still larger ships are expected to be economically available on charter. The inability of many ore handling ports in Britain to receive these larger ships has been one of the factors limiting the economical handling of ore imports, which prompted the British Iron and Steel Federation to investigate last year the possibility of deepening berths at certain harbours conveniently situated for coastal works.

MORE COAL IS CHINA'S 1961 AIM

"China's most important industrial task this year is to fortify its extraction industry, especially coal mining," according to a leading article published last month in a Peking newspaper, the *People's Daily*.

Coal output had risen from 130,000,000 tons in 1957 to 425,000,000 tons in 1960, the article pointed out, and the output of crude oil, iron, copper, lead and other non-ferrous metals had either reached or, in some cases, surpassed the final targets set for the second five-year plan. While these successes in the extracting industries had been powerfully reflected in the processing industries demand from them was by no means being met in full. It was urgent and important to bring the extracting and processing industries into balance. The immediate task, the article continued, was to increase the output of existing large mines, especially of the existing coal mines, though it was suggested this should not be allowed to hold up the mechanization and other improvements of the numerous medium-sized coal and iron mines which are scattered all over the country, or the sinking of new shafts.

A later report from Peking stated that more than 70 major coal mines had begun to deepen their coal shafts. These mines included those at Kailan and Fengfeng (N. China) at Fushun (N.E. China) and Tzepo (E. China) where output has greatly surpassed designed capacity over the past three years.

Thompson Starts Up

The plant site area at Thompson as it looks today

INCO'S Thompson nickel refining project in Northern Manitoba was formally opened on March 26 by Mr. Duff Roblin, Premier of Manitoba, Mr. Henry S. Wingate, chairman of Inco and Mr. J. Roy Gordon, president of the company.

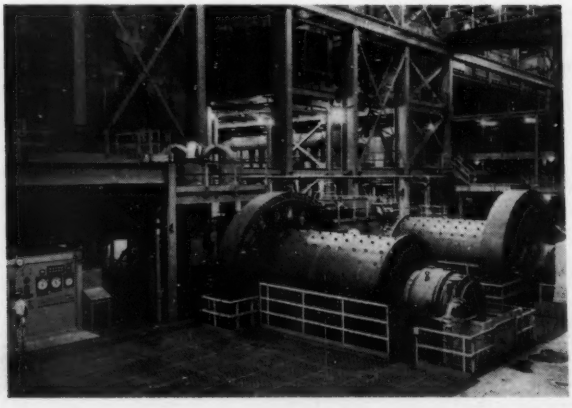
The Thompson project, to which Inco has contributed about $130,000,000 of the total of $185,000,000, is the most modern nickel operation in the world, second only to the company's operations in Ontario and has started operating only 51 months after plans were announced. It will increase Inco's annual nickel producing capacity by more than 37,500 s.tons, bringing it to more than 192,500 s.tons. The plant has been highly mechanized to effect economical production and consists of mine, headframe, and concentrator, smelter, refinery which employs a new process developed by Inco's research scientists and engineers, and service buildings. Power for the plant and for the adjacent township is being supplied by the Kelsey generating station of the Manitoba Hydro-Electric Board on the Nelson River, 53 miles to the north-east. At present the number employed is 1,800 which will rise soon to 2,300.

The town of Thompson, which has been planned to accommodate a population of 8,000 with provision for expansion, covers 3,000 acres provided by the company which has defrayed the cost of town planning, utilities engineering and installation of such basic facilities as underground storm drainage, a domestic water supply system, roads, sewage systems, a municipal administration building, a fire station and four completely furnished schools. Inco has also built and operates a fully-equipped hospital and a water treatment plant. Altogether the company contributed about $8,500,000 to the development of the town.

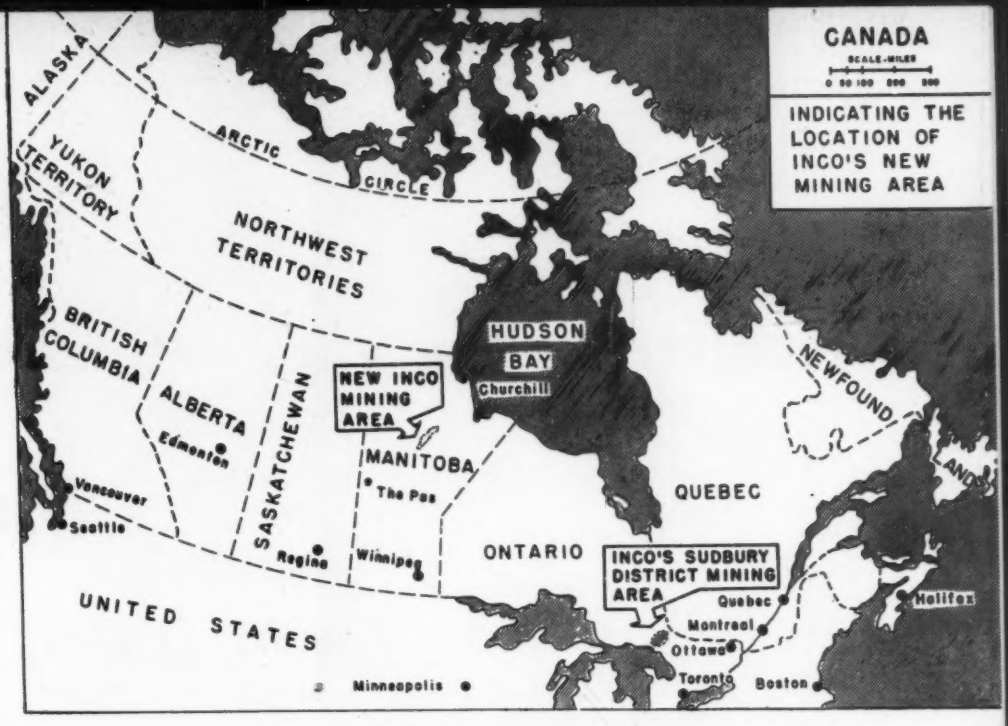
Mr. Duff Roblin said "The impact of this great Inco development is far-reaching. Basically, the 1961 output from this mine, in conjunction with new developments to our west, will boost the total value of our metal production to three times what it was in 1960. "He said it would double the value of all the province's mineral production—metals, industrial minerals and oil—in a single year.

Operations at Thompson. Underground drilling

Operations at Thompson. Crushing and grinding



Alongsidé at right. The Thompson mining area shown in relation to the rest of Canada

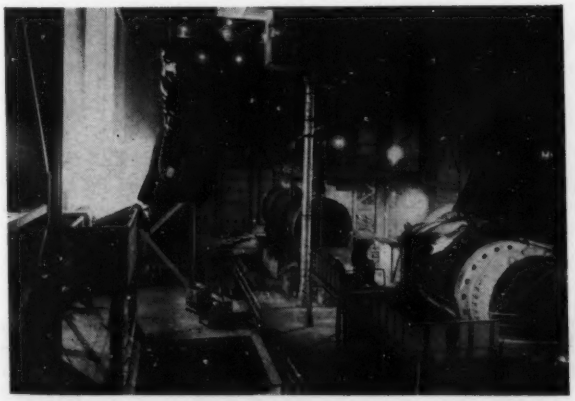


Below, at bottom right of page, the flotation machines at the Thompson mill

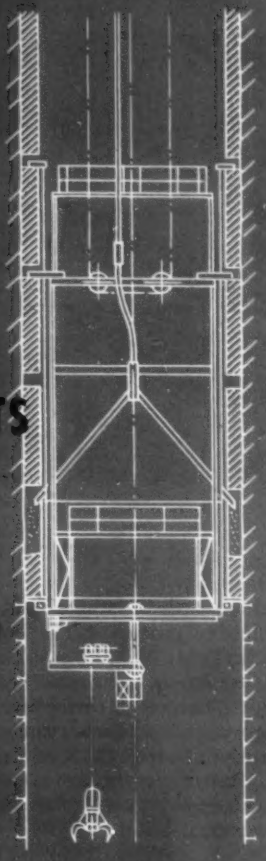
"All our new output from Manitoba, a completely finished product in the form of electrolytically refined nickel", Mr. Wingate said, "must go outside Canada to find use in the diversified markets we are building in the U.S., Europe and elsewhere". Canada's own consumption was capable of supporting not much more than one out of every 40 lb. of Canada's nickel-producing capacity. Inco, therefore, was at once a mighty contributor to Canada's export trade, but also mightily dependent upon its international position.

Since the discovery of the Sudbury deposits in Ontario three-quarters of a century ago, Inco has developed more and larger markets for nickel by stimulating its use whenever that use was technically and economically sound. "As as result of continuing and exhaustive research and of co-operation with the scientists and technicians of industry, nickel—once considered a worthless metal—has become a significant contributor to the progress of our time", said Mr. Wingate. It would be essential to the new fields being explored by science and modern technology.

Operations at Thompson. The smelter converter aisle



FROM EXPLORATION WELLS



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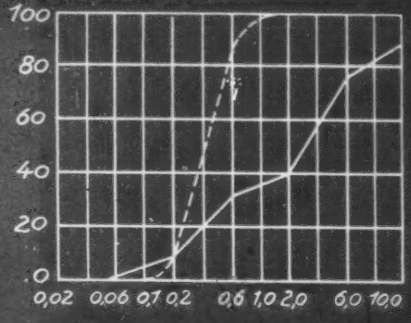

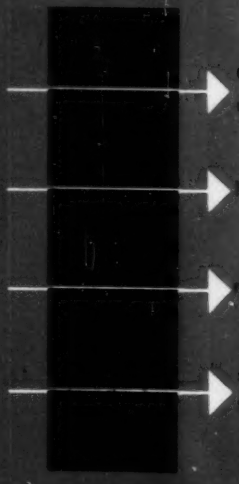

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Finland's Mining Industry

THE output of the ore mines in Finland rose in 1960 to the record total of nearly 3,400,000 tonnes. The increase in the volume of output compared with that of the previous year was about 30 per cent. For the sake of comparison it should be mentioned that the corresponding figure in 1950 was less than 800,000 tonnes.

Increased Production

Production has continued at the same level at the Outokumpu copper mine, the Vihanti zinc mine and the Ylöjärvi copper mine, all owned by the Outokumpu Oy. The same company's Kotalahti nickel-copper mine had its first year of full capacity operation. A new smelter for the production of electrolytic nickel was erected at its Harjavalta works in 1960. At the Korsnäs lead mine the surface plant was completed and production began in 1960 on a limited scale.

Construction and development at the Pyhäsalmi copper and zinc bearing pyrite deposit of the Outokumpu Oy have continued and production is expected to begin in 1962. The pyrite produced at this mine will be treated at Kokkola in a plant now under construction.

Ore investigations at the Metsämonttu mine are being continued by diamond drilling on deeper levels. At Kemi, where the Geological Survey of Finland found a chromite ore deposit provisionally estimated to contain over 15,000,000 tonnes of ore (20 per cent Cr_2O_3) the Outokumpu Oy resumed exploration in the Spring of 1960. The extent of the deposit and the metallurgical treatment for this type of ore are to be investigated.

At the Otanmäki iron mine of the Otanmäki Oy production remained at an unchanged level. The output of vanadium was higher but that of ilmenite decreased. The company's Kärväsvaara iron mine, in the region of Misi, had its first year of full capacity operation. Further exploration took place of the Raajäjarvi iron ore deposit, situated in the same region. In the Kolari iron ore field, now owned by the Otanmäki Oy, exploration was also continued. Construction of the railway to Kolari was started in 1960.

Production at the Haveri gold mine, owned by the Oy Vuoksenniska AB, was discontinued as unprofitable at the end of 1960. Investigations are being continued, however, to examine the possibilities of resuming operations.

Mineral Production

(tonnes unless otherwise stated)

	1958	1959	1960
Iron conc. and pellets ...	215.000	228.000	286.000
Pyrite	255.000	263.000	259,000
Copper conc.	139.000	145.000	136.000
Zinc conc.	86.000	98.000	77.000
Ilmenite	106,000	86.000	65.000
Nickel conc.	—	4.700	36.000
Lead conc.	4,000	3,400	3,100
Vanadium pentoxide ...	700	900	990
Uranium conc.	—	—	49
Wolfram conc.	320	70	—
Silver, kg.	17,400	16,300	12,100
Gold, kg.	790	730	630

The Paukkajanvaara uranium mine, owned by the Atomienergia Oy, started production in the summer of 1960. Its product is a precipitated uranium concentrate.

The Ruskealan Marmori Oy has continued exploration and development at the Liukonlahti copper deposit.

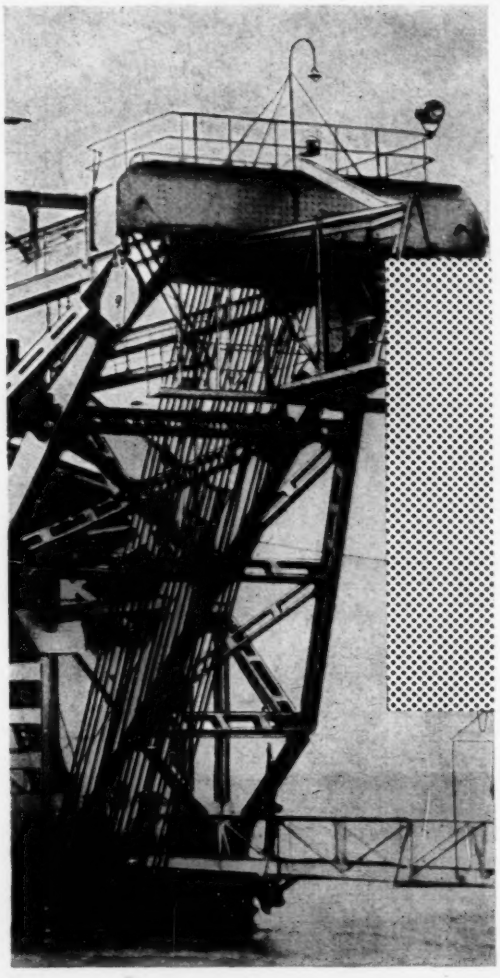
Iron Ore

Construction and development at the Jussarö iron mine of the Oy Vuoksenniska AB were continued with a view to the start of production in the spring of 1961. The iron ore produced at the mine will be treated in the new blast furnace plant at Koverhar, built by the Oy Koverhar AB. This company was established in the spring of 1960 by the Oy Vuoksenniska AB and a Swedish company. The blast furnace plant will produce 250,000 tonnes of pig iron annually. Oy Vuoksenniska AB finished investigations at the Nyhamn iron ore deposit in the spring of 1960.

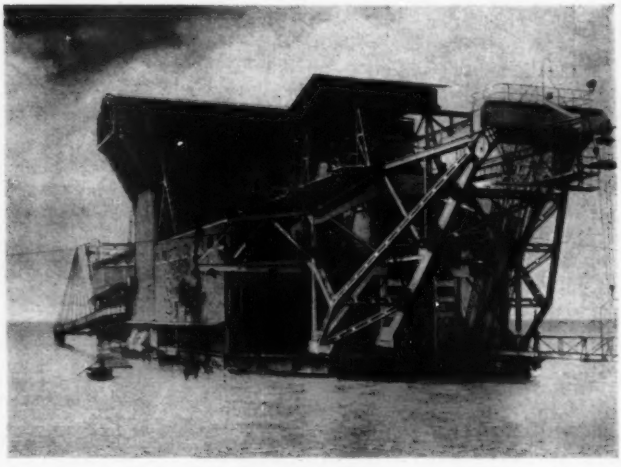
For the utilization of Northern Finland's iron ore deposits a new iron-steel works has been planned. For this purpose a new company, the Rautaruukki Oy, was established at the beginning of 1960. The first phase of its programme comprised the erection of a blast furnace works at Raahe with an annual production of 350,000 tonnes of pig iron.

By Herman Stigzelius, D.Tech.

When you need dredgers, washing plant or other equipment..... think of I.H.C. Holland



Dredgers for mining alluvial ore-bearing layers or for clearing away sterile top soil, jigs and other washing plant, transporters of all types, materials handling plant - they are all regular items in I.H.C. Holland's building programme.



The success of all mining operations depends - in the long run - on the efficiency of the equipment used. I.H.C. Holland have a research laboratory, the Mineral Technological Institute, where soil-handling problems can be studied for you.

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Aerial Survey — II

AIRBORNE METHODS OF OBTAINING GROUND CONTROL

The following article describes various efficient instruments for use in aerial survey work, notably for ground control and plotting duties. The article is the second and concluding instalment dealing with this type of exploration, with particular reference to its use in the mining industry

By J. R. Hall

Research Officer, Hunting Surveys Ltd.

THE Airborne Profile Recorder (A.P.R.) is a precision narrow beam radar altimeter which measures the height of a survey aircraft above the ground; a hypsometer is used to measure the deviation of the aircraft from a constant pressure surface. The records from these two instruments, automatically combined, give the distance of the ground from the constant pressure surface which, when recorded on a continuous chart, is a profile of the strip of terrain directly below the aircraft. However, any constant pressure surface in the atmosphere will slope one way or another according to the disposition of the meterological pressure systems in the area, but this complication is overcome by recording information on aircraft drift and true airspeed (by analysis of the Doppler record), from which data the slope of the constant pressure surface can be computed with accuracy.

Rigidly fixed to the 40 in. dish shaped A.P.R. aerial, and aligned with its beam, is a positioning camera the exposures of which are correlated with the profile record. It is, therefore, only necessary to provide key data, in the shape of one or two points on the area accurately heighted by conventional ground methods, to permit heights to be read off the profile and subsequently related, via the positioning photographs, to the terrain detail.

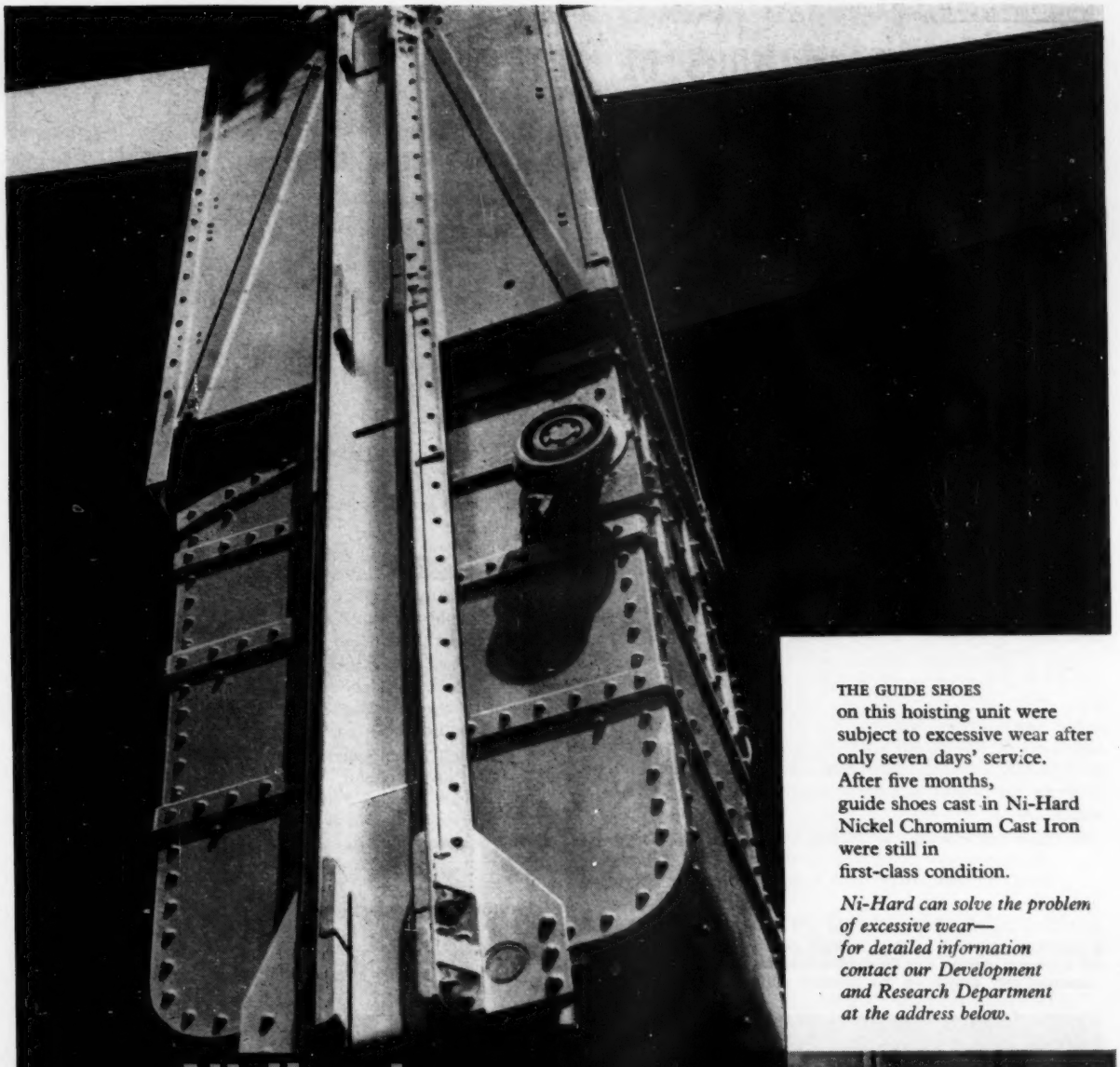
Very convincing evidence of the advantages of using A.P.R. was produced by a recent contract for 1 : 50,000 scale mapping with 20 ft. contours of the area for a projected reservoir in Nigeria. In a paper on this subject presented to the Ninth International Congress of Photogrammetry, Mr. P. G. Mott, Technical Director of Hunting Surveys Ltd., drew attention to the following points :—

1. Ground levelling to control the A.P.R. profiles took 38 man-weeks compared to the estimated 170 man-weeks needed to provide height control by the normal ground methods for the photogrammetric mapping;
2. The contoured maps of the whole reservoir area were delivered within three months of completion of photography and A.P.R. flying. This time table could not have been met had conventional methods been used;
3. The cost of the survey with A.P.R. control showed a saving of about 23 per cent over the estimated cost of the job using conventional ground height control methods;
4. Eighty per cent of the 192 A.P.R. points checked against ground levelling showed no greater error than 5 ft., and 100 per cent were within 10 ft., the permissible error for the scale of contour interval chosen for the contract.

A photogrammetrist at the controls of the Wild A. 7. When the operator guides the floating reference mark, the shape is automatically drawn on the plotting table in the foreground

Plotting Instruments

New developments in the field of plotting instruments have been mainly due to the advent of the super wide-



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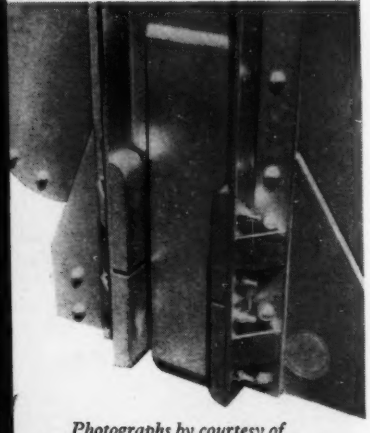

Photographs by courtesy of Wabi Iron Works Ltd, Ontario show how guide shoes were fitted.

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A photographic aeroplane. Visible in the picture is the glass port in the nose for a forward facing camera, under nose radome containing the Marconi Doppler Navigator, while behind the wing is seen the fairing in which is the antenna of the airborne profile recorder

angle lens. The familiar stereo plotting machines which have been used for map making in the last decade were designed round the 6 in. wide-angle lens which had become almost the standard equipment for aerial survey, but these plotters were unable to accommodate diapositives from the 3½ in. super wide-angle camera.

To correct this situation, Wild Ltd. have produced a range of new plotting instruments, based on the company's mechanical restitution system but adapted to the new optical formula. Of these machines, the B.8 and B.9 are purely for plotting detail from individual stereo pairs of photographs, scale and orientation being dependent upon control supplied from ground or aero triangulation.

The A.9 is a higher order machine which, in addition to plotting, can also be used to supply aero triangulation; that is to say it can start with the rigid framework of ground control points supplied in the overlap of a pair of photographs and extend this framework geodetically, and without further ground survey, over a bridge of ten or a dozen overlaps to another framework of points surveyed on the ground, and so on down a photographic run across a territory. In other words, it can map an area in which the barest framework of ground control has been established; and furthermore, it can interpolate triangulated control points for all the intervening overlaps and so supply the control required to enable lower order machines to be used in plotting the detail on the area.

Automatic Plotting Machines

Directly related to the statement that speed is one of the prime purposes of air survey, is the extreme importance of the invention of an automatic plotting system called Stereomat. The scientist behind this technical breakthrough is G. L. Hobrough, of the research and development division of Hunting Associates Ltd., Toronto. Stereomat uses the optical and mechanical parts of a conventional plotting instrument, but in place of a human operator it imposes upon the instrument parallax sensing by electronic means, while servo motors provide the motions for setting pairs of photographs in correspondence. Stereomat performs automatically relative orientation, contouring, profiling, and the plotting of drainage patterns. It also assists the human operator during absolute orientation and the plotting of planimetric detail.

Even though the speed with which flying and photography can be carried out is dependent upon weather conditions, the plotting process in general is at present more time consuming. Rate of strike can only be improved by spreading the work over more plotting machines. Stereomat will carry out some processes up to a hundred times faster than the rate achieved on a manually operated machine, and Stereomat is not subject to fatigue. The impact of this development will have a profound effect on the speed with which maps can be produced from air photography.

Some Points of Interest to the Mining Engineer

In conclusion, some facts and figures about the scales and accuracies that can be achieved with modern air mapping techniques, and some examples of work done for prospecting and mining corporations and authorities, are taken from the records of Hunting Surveys Ltd. of London.

Maps are made to any scale from 1 in. to the mile down to 1 in. to 40 ft., or 1/480. Contours can be added to the map at any vertical interval required by the client, but normally this is in conformity with the scale of the map, e.g. on a map at 1/50,000 scale the contour interval required may be 20 or 30 ft., but on a map at 1/480 scale the contours will probably be required to 1 ft. Such contours are guaranteed accurate to half the vertical interval in accordance with normal practice. To be more specific; in the case of a 1/480 plan with 1 ft. contours made on a stereoplotting machine from air photography, accuracy of location is 4-6 in., accuracy of contours is to half the vertical interval, and accuracy of spot heights (on a good hard surface) is 2 to 4 in. Furthermore, area measurements can be made to within 0.7 per cent while volume measurements of stockpiles or open cavities can be defined to 0.3 per cent.

Air survey has been used by mining interests for a wide variety of purposes in many parts of the world, but some typical examples are quoted. In Tanganyika an area of nearly 20,000 sq. miles was photographed, and mosaics at 1/50,000 scale supplied to Williamson Diamonds Ltd. for use as base maps for the field work of a prospecting programme in the area.

In Mauretania and the Congo and Ghana air photographs were used in photo-geological studies to aid the interpretation of the data produced by airborne geophysical surveys of the areas. In Jordan photo-geology has been used to locate phosphates and manganese, in Nigeria in the search for pegmatites and alluvial deposits, and throughout East and Central Africa the study of air photography has been used extensively in regional exploration for minerals.

Mining interests in Cyprus have been supplied with photography and mosaics at 1/8,000 scale for geological study, and numerous small sites have been mapped at varying scales such as 1/10,000 with 10 m. contours, 1/2,500 with 2 m. contours, and 1/1,000 with 1½ m. contours.

In northern Greece a rugged area was photographed for the Hellenic Mining Co. A section was mapped at 1/1,000 with 2 m. contours; an additional "bonus" was added when it was found that the photography of the thickly forested country showed the spoil heaps from ancient surface workings, clues suggesting the need for further investigation on the ground.

Finally, work in Britain for the National Coal Board has included mosaics at 1/2,500 of colliery areas in Scotland; the addition of 2½ ft. contours and spot heights to the 25 in. O.S. maps in Kent and Nottinghamshire; and 1/1,250 maps with 2 ft. contours of colliery districts in the West Midlands Division.

In all, aerial survey can offer to the mining engineer swift and accurate assistance anywhere in the world, no matter how remote his site may be.

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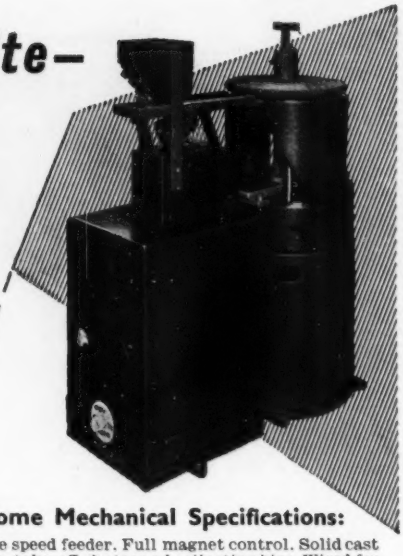

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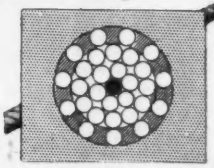

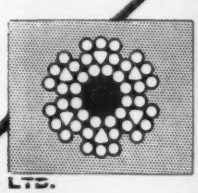

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Machinery and Equipment

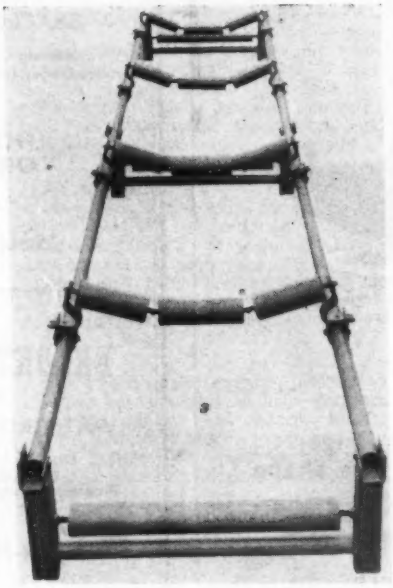
New Tubular Conveyor Framework

Richard Sutcliffe Ltd., has introduced a new type of tubular conveyor framework with cushion mounted slung idlers designed to give resilience to the belt under differing load conditions. This arrangement allows the belt to form a deeper trough as the load increases, thus decreasing the chance of spillage.

An equally important advantage is that individual members can be easily and neatly packed to facilitate transport underground. The framework is the open type, has no cover sheets and may be simply and speedily erected or dismantled. Up to and including 30 in. belt width the stools are at 10 ft. centres and the idlers at 5 ft. centres. For 36 in. and 42 in. belt widths the stool centres are 9 ft. and the idler centres 4 ft. 6 in.

The depth of trough is determined by the weight and nature of the load, the give in the idler being provided by a rubber cushioning block mounted between the stringer tube and the idler bracket. The maximum deflection from zero to maximum load is approximately 2½ in. The centre troughing idler spindle is pin jointed at its end to the wing idler spindles which, in turn, are hooked over the end idler brackets and locked.

Support brackets on top of the stools are so arranged that the framework can be slung from the roof by ropes or chains. Allowance is also made for lateral adjustment of the idler sets. The return and idler rollers are the same as those used in other types of Sutcliffe framework.



The new type of tubular conveyor framework introduced by Richard Sutcliffe Ltd.

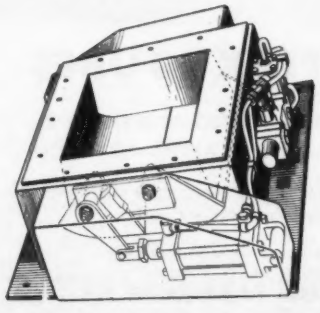
PNEUMATICALLY OPERATED BIN OUTLET

A new type of pneumatically operated bin outlet has been produced by Lindars Automation Ltd., designed for the control of heavy materials from bins and hoppers. This is in the form of a heavy duty clamshell shutter gate which, while allowing a free flow to the material being discharged, has a positive action when closing which completely cuts off the material without the risk of jamming, even when handling large sized pieces.

It is of robust construction in mild steel and all the operating mechanism is protected from dust and from contact with the material being handled, as it is placed outside the shutter gate body. This arrangement further ensures that all parts requiring maintenance are readily accessible. The valves may be worked electrically or manually and a series of shutter gates can be arranged for automatic operation by remote control, if necessary in a given sequence. Sealing strips to prevent air leakage can be fitted as an optional extra.

Six standard sizes are available with openings ranging from 4½ in. x 4½ in. to 18 in. x 18 in.

Heavy duty clamshell shutter gate



OIL HYDRAULIC GEAR PUMPS

A new range of hydraulic gear pumps, incorporating many advanced design features, has been developed by Joseph Young and Sons Ltd. The units are of the constant displacement type and are primarily intended for heavy duty applications involving either continuous or intermittent operation such as mechanical handling equipment, coal mining appliances, earth moving vehicles and hydraulic control systems of all kinds.

There are four basic models in the new Young range, each being available with side or end ports. The capacities are 12.5 g.p.m., 18 g.p.m., 24 g.p.m. and 30 g.p.m., at 1,000 r.p.m. All have square flange mountings and are interchangeable.

The pumps are robust, precision-built units designed to give a long and reliable working life with a minimum of maintenance. An important new feature is that the direction of rotation can be changed simply by inverting the end plate. Another new development is the ingenious system of grooves formed in the end cover which relieves the build-up of pressure due to the trapping of oil at the bottom of the gear teeth and eliminates pressure on the oil seals and joint faces.

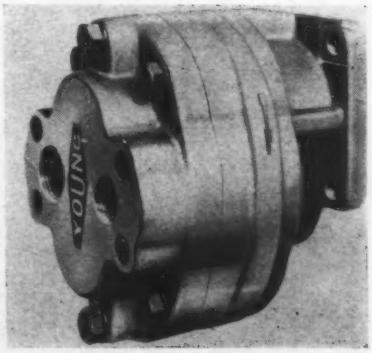
The unique design of the cheek plates —exclusive to Young pumps—ensures the maintenance of maximum working pressure. The four cheek plates are relieved for balancing the gears laterally, thereby avoiding an uneven pressure loading on the gear faces — a feature which improves efficiency and eliminates a common source of wear. Also new is the positioning of the driving shaft by deep groove ball bearings so that no side thrust is imposed on the gear faces or cheek plates. Radial load of both shafts is taken by rigid needle roller bearings.

EXPLOSION-PROOF MIXING

By the development of the Waring explosion-proof blendor motor base, the explosion hazard which may occur when mixing certain volatile liquids and organic materials, is claimed to have been entirely eliminated. This high-speed blendor motor base, which mixes at speeds of 8,000 or 16,000 r.p.m., is being marketed in the United Kingdom prior to later manufacture in Britain, by the Waring Division of Winston Electronics, on behalf of the Waring Products Corporation, New York, a sister subsidiary of the Dynamics Corporation of America. The manufacture in Britain will make this industrial explosion-proof mixer available for the first time in the United Kingdom and Commonwealth, for which Winston Electronics have sole manufacturing and marketing rights. Because of the manufacturing plans being carried out, servicing facilities are immediately available.

The main cause of fire and minor explosions when inflammable liquids and solids are mixed, is through the vapour in the immediate atmosphere becoming ignited from the arcs of the electric motor brushes, or when the mixture is accidentally split. The chemicals, many of which produce inflammable vapours, with which this equipment is now extensively and constantly used in the U.S. include petrol, naphtha, benzine, butane, propane, alcohol, acetone, benzol, natural gas or solvent vapours and the resultant blended products include petroleum-based lubricants, petroleum ether, ethyl ether, low vapour gasolene, acetone, methyl alcohol, ethyl alcohol, benzine, toluene, isopropyl alcohol and unstripped latex.

An oil hydraulic gear pump



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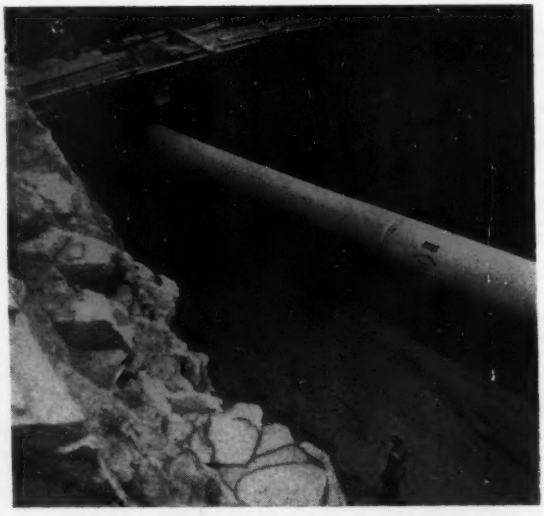

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★

The United States has made a special assistance loan of $3,500,000 to Bolivia. The loan represents part of a $10,000,000 credit to Bolivia announced in La Paz in November last year. The loan is to help in rehabilitating the Bolivian Mining Corporation mines and concentration plants. The U.S. State Department has said that the loan represents the U.S. contribution to the first phase of a triangular arrangement whereby the Federal Republic of Germany and the Inter-American Development Bank expect to make similar amounts available to Bolivia.

★

The Diamond Corporation of Sierra Leone has agreed to lend the government £1,000,000 at 3½ per cent for 10 years to complete financing of the Guma Valley water and hydro-electric scheme.

★

The Anaconda Co. announce that a pipeline employed in Northern Chile has hauled over 173,000,000 lb. of copper concentrates 14 miles from mine to smelter without operating incidents and at economic cost, demonstrating feasibility of this form of "hydraulic transporation".

★

A team of Swiss and German experts is studying the problem of a 20-mile ropeway in India, from the top of the iron ore hills in South Kanara to the port of Coondapur for transporting ores. It was stated that this ropeway would reduce cost of transporting the ore from the present Rs. 30 a ton, to a bare Rs. 2, and be able to carry very large loads. Iron ore development is now being carried on by the State government in this area.

★

A Japanese firm, Mutsuo Mining Co., is to apply to the Southern Rhodesian Government for approval of a plan to establish a mining company to develop tantalite and beryl mines in Southern Rhodesia. Japanese Government approval has already been obtained.

★

The Indian Bureau of Mines has announced that total production of iron ore in India during 1960 was 10,655,000 tonnes, a 33 per cent rise on the figure for 1959. Orissa had an output of 3,720,000 tonnes, followed by Bihar with 2,844,000 tonnes, Mysore, Madhya Pradesh and Maharashtra, recording 1,867,000, 1,449,000 and 320,000 tonnes, respectively.

★

Mexico's new mining law, which has been passed by Congress, provides that any company which does not reduce foreign shareholding to 49 per cent or less will no longer be able to obtain new concessions which will mean their closing down when present concessions run out. At the same time, companies with a 51 per cent Mexican shareholding will be entitled to an immediate reduction of 50 per cent of present taxation.

★

The mining company exploiting manganese in the property of the former Belgian Congo, Bécéka-Manganese, announced that 1960 production amounted to 390,000 tonnes of manganese ores, compared with an output of 290,000 in 1959.

★

Yugoslavia's five-year plan for the period 1961-1965 includes an increased annual production of aluminium from 23,000 to 47,000 tonnes; of copper from 35,300 to 77,000 tonnes; zinc, from 34,000 to 58,000 tonnes, and lead from 87,000 to 113,000 tonnes.

★

The Czech mines' research institute at Ostrava has designed a high pressure pump to prevent dust hazards, known as the "Multiplikator", to irrigate coal seams. It drives water into the coal mass under a pressure of 200 atmospheres, with a resulting reduction of dust content in 1 cu. m. of coal from 580 mg. to 40-70 m.g.

AUSTRALIAN BEACH SANDS

The article entitled "Recovery of Minerals from Western Australian Beach Sands" which appeared in our issue of February 3, 1961, was wrongly attributed to the Australian Association of Beach Sands Producers. The article was, in fact, prepared by Mr. E. E. Brisbane, State Mining Engineer, on behalf of the Mines Department, Government of Western Australia.

British Equipment for Australia

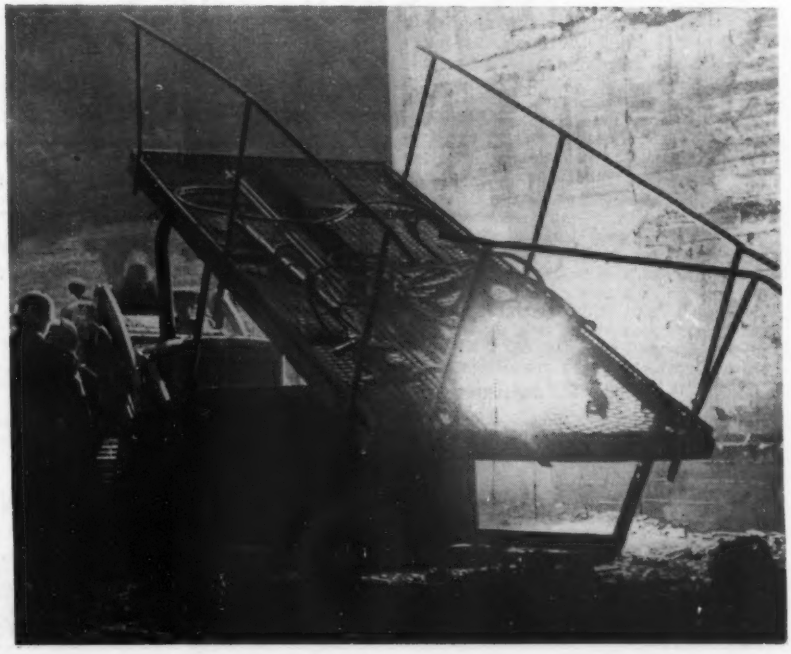
It was announced on Monday that Head Wrightson (Australia) Pty. Ltd., of Sydney, a subsidiary of Head Wrightson and Co. Ltd., have received orders valued at approximately £3,500,000 from The Broken Hill Proprietary Co. Ltd. and from Australian Iron and Steel Ltd. The orders include the design, manufacture, and erection of a scree ore treatment plant, a basic oxygen steelmaking plant and a tin plate cut-up line.

The scree ore treatment plant will treat 1,200,000 tons per year of scree deposits from the flanks of Iron Knob and will have an output of 800,000 tons of concentrate averaging about 60 per cent iron content. The engineering for this plant will be carried out by Head Wrightson Minerals Engineering Ltd.

The order for the basic oxygen steelmaking plant is the first export order to be secured by a British firm for the supply of a complete plant using any of the new oxygen steelmaking processes. This plant, with an output of approximately 500,000 tons of steel per year, will be installed at Whyalla in South Australia and will be engineered in the United Kingdom by Head Wrightson Iron and Steel Works Engineering Ltd.

The tinplate cut-up line will be built to the designs of The Head Wrightson Machine Co. Ltd., of Middlesbrough, and is a repeat order, a similar line having gone into production a few months ago at the Port Kembla Works of Australian Iron annd Steel Ltd. The engineering for the whole of this line and part of the equipment will be supplied by The Head Wrightson Machine Co., but the major part of the equipment will be manufactured in Australia. Equipment and services valued at almost £1,000,000 sterling, will be supplied from the Head Wrightson Works (Tees-side).

A drilling rig which can be quickly attached to a Libu bucket with four bolts and which carries three men and their equipment. The photograph was taken in Oslo, Norway, where the Libu is fulfilling a useful function in addition to its main role of muckshifting



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Metals and Minerals

Aluminium in 1960

Mr. Nathanael V. Davis, in his statement to shareholders of Aluminium Ltd., gives his usual comprehensive survey of aluminium's progress during the year under review. In 1960, the international aluminium industry continued to show growth, he states. Estimated total consumption in the Free World as a whole was 4,355,000 s.tons, made up of 3,475,000 tons of primary aluminium and 880,000 tons of secondary metal, this being an increase of about 2 per cent over 1959. In turn, consumption in 1959 had been over 25 per cent greater than in 1958.

Free World primary production in 1960 is estimated at close to 4,000,000 tons, indicating substantial inventory accumulation during the year. Moreover, the industry was still faced with the problem of surplus facilities since total capacity by the year end had reached 4,700,000 tons. The extent of this excess capacity, which increased last year by at least as much as primary production, largely determined international trading patterns during the year, and it will inevitably affect the pattern of marketing in 1961. Most of this excess capacity is located in North America.

The continuing general business prosperity in 1960 in Western Europe, Asia and Australia produced strong aluminium demand in all these areas and intensive competition for business. Ingot prices were consequently under constant pressure. Hence the group's total sales of aluminium, though 9½ per cent higher in tonnage (aided by some rebuilding of customers' stocks) than in the previous year, produced a net income of $39,100,000 which, while higher than the $24,000,000 for 1959, was below the record total of $55,600,000 achieved in 1956. The company regards the prevailing highly competitive conditions as a challenge rather than a depressant.

Group sales of aluminium amounted to 705,100 tons in 1960 compared with 643,000 tons in 1959 and 581,200 tons in 1958. The principal markets continued to be the U.K., the U.S., Canada and West Germany, while Belgium, Italy, Scandinavia, Japan, Brazil, Australia and India comprised markets of increasing importance. Sales in the U.S. declined materially and those in Canada slightly. Exports from the Soviet Union were a minor factor in world trade last year, although to the extent that sales occurred they were made at discount prices.

Alcan produced 637,800 s.tons of primary aluminium in 1960, compared with 503,500 tons in 1959 and 600,400 tons during 1958. From an average of 66 per cent of capacity in 1959, the company's production rate was increased in stages to achieve an average production rate of 85 per cent of capacity for 1960 as a whole. This permitted the rebuilding of inventories of primary aluminium to an optimum level. During the second half of 1960, production was adjusted downwards and reached 80 per cent of capacity, or an approximate rate of 600,000 t.p.a., by the end of December, at which it remains. This production rate, augmented by acquisitions from other subsidiaries and sources, is expected to bring supplies more closely into line with the level of sales anticipated in the early part of 1961.

During the year, Aluminium Ltd.'s other smelting subsidiaries and affiliates (including Chryslum Ltd in Canada and those in Brazil, India, Italy, Japan, Norway and Sweden) produced a total of approximately 190,000 tons. Production in Norway was adversely affected by reduced power generation due to low rainfall. Certain of these overseas companies undertook expansion of their primary capacity to meet expected requirements of their local markets in circumstances where foreign exchange and other factors militated against full reliance on imports.

Reflecting in part the net increase in aluminium production in 1960, the output of bauxite from the company's principal mining operations in British Guiana, Jamaica and Guinea was considerably greater than in 1959. Sales of alumina to third parties reached record levels and those of calcined bauxite were at a high level. In British Guiana Demerera Bauxite Co. Ltd., produced more than 2,000,000 tons of bauxite. In Guinea, dried bauxite production reached 573,000 tons compared with 332,000 tons in 1959. In Jamaica, Alumina Jamaica Ltd. operated its Ewarton and Kirkvine alumina plants at full capacity, producing a total of approximately 715,000 tons. Demerera virtually completed construction of its new 245,000 ton alumina plant at Mackenzie by the end of December and began production early in 1961. This plant was officially inaugurated by Dr. Cheddi Jagan, Minister of Trade and Industry, on March 28. Its completion brings Aluminium Ltd.'s total alumina capacity to more than 2,500,000 t.p.a. Société Anonyme des Bauxites et Alumines de Provence, which operates bauxite mines in Southern France, increased its production to 300,000 tons during 1960. Bauxites du Midi, another French subsidiary, continued with the construction of the railway for the projected bauxite and alumina complex in the Boké region of Guinea.

In 1960, Aluminium Ltd. expanded its fabricating activities over a wide field. The company now has fabricating subsidiaries or affiliates in more than 25 countries, but its primary production capacity remains, and will remain, well in excess of its total fabricating capacity.

The company is convinced that free trade in aluminium is in the best interests of the industry and the consumers throughout the Western nations, believing that if consumption is to continue to show dynamic growth, the metal must be increasingly competitive with other materials. The hope is expressed that there will be a general agreement to lower aluminium tariffs as a result of the G.A.T.T. negotiations now in progress.

LONDON METAL AND ORE PRICES, MARCH 29, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 0d. lb.
Cerium (99%) net, £15 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium. 99.99%. Ge. kilo lots 2s. 5d. per gram
Gold, 250s. 10d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram.
Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £600 per ton
Osmium, £18/£22 oz. nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £28/£28¼
Quicksilver, £69 ex-warehouse
Rhodium, £43/£45 oz
Ruthenium, £14/£16 oz. nom.
Selenium, 46s. 6d. per lb.
Silver, 79¼d. f. oz. spot and 80d. f'd.
Tellurium, 28s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis		25s. 0d./27s. 6d per unit c.i.f.
Beryl (min. 10 per cent BeO)		250s./260s. per l. ton unit BeO
Bismuth		30% 5s. 0d. lb c.i.f.
		20% 3s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable 48%)	(Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
„ Hard Lumpy 45%	(Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
„ Refractory 40%		£11 0s. 0d per ton c.i.f.
„ Smalls 44%	(Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides	(Ratio 10 : 1) Nb_2O_5 : Ta_2O_5	165s./170s. 0d. per l. ton unit c.i.f.
Fluorspar—		
Acid Grade Flotated Material		£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)		156s. 0d. ex. works
Lithium Ore—		
Petalite min. 3½% Li_2O		50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		50s. 0d./55s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		75s./85s. per ton f.o.b. Beira
Magnesite ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46%-48%) basis 60s. 0d. freight		73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)		69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)		nom.
Molybdenite (85%) basis		8s. 11d. per lb. (f.o.b.)
Titanium Ore—		
Rutile 95/97% TiO_2 (prompt delivery)		£25 10s. 0d per ton c.i.f. Aust'n
Ilmenite 50/52% TiO_2		£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)		119s. 0d./124s. 0d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65-66% ZrO_2		£16 ton c.i.f

EASTER EGG FOR CANADIAN URANIUM MINES?

Tremendous excitement has been aroused in Canada by the astonishing disclosure of a contract under which, it appears, Britain is to buy 12.000 s.tons of uranium from Canada for delivery during the period March 31, 1963, to December 31, 1966. At the price of $8 per lb. agreed upon in the letter of

intent, the total cost to Britain would be $192,000,000 (£68,000,000). This programme is additional to the known delivery contracts involving 10,500 s.tons of uranium oxide, which are the subject of the existing stretch-out arrangements. The delivery of such a tonnage between 1963 and 1966 would obviously be an embarrassment to the U.K.A.E.A., and it is understood that Britain is seeking a renegotiation of the arrangements. Mr. Diefenbaker, Canadian Prime Minister, told the House of Commons that he would comment this week both on why the contract, said to be worth $200,000,000 and signed four years ago, has only now become public knowledge and how it will be allocated.

According to the Trade Minister, Mr. Heeds, Canada has informed Britain that she could not contemplate any reduction in the quantity of uranium involved, though she might consider a price lower than the agreed $8. Mr. W. M. Gilchrist, head of Eldorado, Canada's uranium agency, had previously told the Commons research committee that the agency had what it considered to be a firm contract on the assumption that an exchange of letters of interest constituted a firm contract.

The implications of this remarkable windfall, if it materializes, for Canadian uranium producers are discussed on page 369.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

Most factors becoming known during the last few days have been of a bearish nature, including the easing of the situation in Laos, the settlement of the port strike in Chile, and the continued uncertainty as to whether or not the U.S. economy is likely to recover substantially during this year. These, combined with the proximity of the Easter holidays, have resulted in the development of weaker undertones and lower prices.

COPPER PRICES EASE

The copper price structure shows signs of weakness inasmuch as the U.S. customs smelter intake price for scrap, after having been firm at the end of last week, has now been reduced to 23¾ c. per lb. with reports of greater volume on offer. None of the other quotations have, however, yet been altered. Stocks in official warehouses at the end of last week fell by 415 tons to a total 14,850 tons, but this reduction has had no effect on the contango rate.

The U.S. Copper Association's figures for the domestic consumption of copper by brass and wire mills and foundries in February, totalled 96,386 s.tons as compared with 100,836 s.tons in the previous month. New business booked, however, rose by some 5,500 s.tons and unfilled orders on the books at the end of January totalled 129,535 s.tons against 123,016 s.tons at the end of the year. Fabricators' stocks showed a slight decrease, but orders on hand with producers showed a welcomed increase.

I.T.C.'S 1960 STATISTICS

The tin market has reached a stage where small fluctuations are to be expected before the situation forces the price up to the £830 per ton mark at which the buffer stock manager is entitled to start selling, should he so desire.

Stocks in official warehouses rose 273 tons at the end of last week to 10,263 tons, and this caused a wider contango to develop on Monday. Statistics issued by the International Tin Council give an estimated world production of tin in concentrates for 1960 as 159,000 l.tons compared with 141,000 l.tons in 1959 and 135,000 l.tons in 1958. The corresponding figures for the world smelter production of metal are 171,000 l.tons, 136,000 l.tons and 140,000 l.tons. In addition, production of tin in concentrates in January was lower in Malaya, Indonesia and Nigeria, but smelter production in Malaya increased to 7,227 tons in January as compared with only 6,391 tons in December.

The output of tin metal in Belgium is now showing signs of the dislocation caused by the trouble in the Congo, as the production of tin metal in December totalled 853 tons, in January 736 tons and in February only 414 tons. Some of this decline may, however, have been due to labour troubles.

On Wednesday the Eastern price was equivalent to £832½ per ton c.i.f. Europe.

LEAD SUPPLIES TO BE CUT— NO ACTION ON ZINC

The results of the lead-zinc conference in Mexico City became known in London on Monday morning and the immediate reaction was for prices to be lowered although selling was not of an exceptionally heavy nature. The main points in the Press release were:—

(1) A curtailment of lead supplies to a level of approximately 2 per cent below estimated world consumption in 1961;

(2) The estimated surplus in supplies in 1960 totalled some 90,000 tons;

(3) The following countries announced that they would undertake specific action to reduce mine and/or metal production, i.e. Australia, Mexico, Peru, Sweden, U.S.A. and countries of The Six;

(4) In addition, Canadian industry had already announced a reduction in its mine production for 1961 and Yugoslavia was prepared to reduce either production or exports during the year;

(5) The U.S. was prepared to negotiate a barter for surplus lead stocks in producers' hands accumulated before December 31, 1960, provided the negotiations were concluded before May 15, 1961;

(6) It was estimated that world consumption in 1961 would be 3 per cent higher than in 1960 and that the production, after curtailments, would be about 2 per cent lower than 1960;

(7) It was hoped that lead exporters of the centrally planned economies would not increase their exports to the rest of the world above the level of last year;

(8) No specific action to reduce zinc supplies was taken;

(9) In 1961 consumption was expected to rise 4 per cent above the 1960 level, although little change was foreseen in the consumption within the U.S.; and

(10) A special working group has been established to examine possible future problems of over-supply including governmental commodity agreements.

The results of the meeting were far more concrete than had been expected by a number of observers, including the writer, and in the long run anything which tends to balance the supply and demand position must be to the good of the industry. In the case of lead, however, it is felt that the present steps are insufficient and that the estimate of a 3 per cent higher consumption this year is over optimistic. The likelihood of a barter arrangement is also queried in view of the U.S. administration's recent acts in refusing to consider legislation to help their domestic mines.

It is understood that the cutback announced by The Six was by means of a global figure, the actual point of restriction being left to be determined by the group itself. The recent events in Spain probably made it unnecessary for that country to make any promises, as the latest figures show that production in February totalled only 3,404 tonnes as compared with 5,179 tonnes in January.

As was expected, nothing was done in the zinc field but, here again, market opinion considered that a 4 per cent increase in consumption solely outside the U.S. was again a little over optimistic. Yet in this case, any upturn in the U.S. economy would immediately alter the picture in a very radical way. To sum up, the market feels that the lead price is likely to recede several lbs. a ton, but that the price of zinc will not be affected to such a large extent.

Stocks of lead in official warehouses fell by 25 tons at the end of last week, but the stocks of zinc rose 232 tons, which addition tended to eliminate the backwardation.

OFFICIAL TURNOVERS

Official turnovers in l.tons for the week ending March 25, with the previous week's figures in parentheses, are:

Copper	14,500	(14,025)
Tin	1,115	(1,255)
Lead	7,575	(10,650)
Zinc	7,600	(9,050)

Closing prices (4 days) are as follows:

	March 23		March 29	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£226	£226½	£224	£224½
Three months ..	£227½	£227¾	£226½	£226½
Settlement ..	£226½		£224½	
LEAD				
Current ½ month	£67⅛	£67½	£65½	£65½
Three months ..	£68⅛	£68½	£66½	£66⅝
TIN				
Cash	£823½	£824	£823	£824
Three months ..	£826	£826½	£827	£827½
Settlement ..	£824		£824	
ZINC				
Current ½ month	£84½	£84¾	£83½	£83⅝
Three months ..	£83¾	£84	£83½	£83¾

Mining Finance

Light and Shade for Anglo American

As was to be expected after the example set recently by De Beers, the diamond member of the group, Anglo American Corporation of South Africa has also included for the first time with its 1960 preliminary results the consolidated figures for the group as a whole. The story told is a different one from that of Union Corporation reviewed here last week.

Unlike that company Anglo American is not consolidating into its accounts the growing profits of an operating gold-mining subsidiary. On the other hand, its investment income, over £1,000,000 up at £8,159,000, increased much more sharply than that of Union Corporation. This is a reflection of Anglo's big diamond and copper holdings, two segments that did very well last year. It is the extent of Anglo American's writing down enforced by the political malaise in mining markets, the consequent small increase in the net group profit and the absence of any advance in the dividend, that represent the final differences in the 1960 experiences of these two big mining houses.

The amounts written off investments, less surplus on realizations, absorb £1,190,000 of Anglo's earnings and the net group profit is thus at £7,842,000 only £111,136 more than a year previously. The dividend is repeated at 1959's advanced total of 9s. with a final of 5s. per 10s. Ordinary share (the interim was doubled at 4s. in order to make the payments more evenly balanced).

General reserve gets £2,875,000 compared with £3,535,309 and the carry-forward is much the same at £766,000 against £703,706. The Ordinary dividend, which absorbs £4,762,000, is still handsomely covered 1.6 times by net earnings and there is a general feeling that a fresh increase in the distribution might have been forthcoming had it not been for the fresh shadow over South Africa thrown by its pending departure from the Commonwealth, an occurrence that must have loomed largely in the minds of the Board headed by Mr. Harry Oppenheimer when it met last week to decide the 1960 payment. Anglo American Corporation is a group of great financial strength, but it always has new ventures on hand and the possibility of raising money for any of these from outside the Union can hardy have been brightened by the latest political events. So a cautious distribution policy by the mining finance houses is almost inevitable, anyway for the time being.

The Anglo American group has, of course, already taken steps to try and combat this shyness of overseas capital by its big re-organization and enlargement of one of its finance members, Rand Selection, now a £100,000,000 concern. Mr. Oppenheimer has expressed the hope that "the size and strength of the company should make it a most favourable channel for attracting money from overseas".

Anglo American are quoted at 137s. 6d.—they were 235s. at one time last year—and the yield after allowing for the final dividend still included in the price is 6.7 per cent. The verdict on them at this level must be that they are a first-class purchase, but only at the moment for those who have the faith to believe that the Rhodesias and South Africa will emerge from their present political difficulties without impairing the prosperity of their great mining industries.

London Market Highlights

In the early part of this week the South African gold share market could only be described as "dreary". No new unfavourable developments occurred in the political scene, but the usual small scattered selling orders from local and Continental sources found the Johannesburg institutions for once disinclined to take stock. The result in an exceedingly thin market was a widespread marking down of prices to new low levels for the year.

Closing dealings on Tuesday saw a slightly steadier tendency emerge, but "with nothing to go for" at the moment, few speculators were willing to back the chances of a recovery. Among the many losses, Free State Geduld fell below £5 a share for the first time since 1958 and St. Helena weakened to a new low for 1961 of 61s. 3d. The Kinross stocks which had been resisting well in recent times, also lost ground; Winkelhaak eased to 21s. 1½d., Bracken to 24s. 4½d. and Leslie to 18s. 9d. The encouraging annual report failed to stimulate Randfontein (19s.).

Gloom spread into the finance group where Union Corporation came back from 54s. 3d. to 51s. 6d. despite the excellent results and Anglo American were lowered from 138s. 9d. to a new low for the year of 136s. 3d. Inevitably, De Beers came under the general shadow and lost 5s. 7½d. to 131s. 10½d. Dullness in the platinum group was not helped by the reduced interim dividends, although the cuts came as no surprise to the market.

Rhodesian coppers were to some extent subdued by the weakness of Kaffirs. However, little selling was seen and the undertone remained steady enough. R.S.T. continued to appear in the list of most active stocks on Wall Street and a renewed U.S. demand for the shares in London lifted the price by 7½d. to 11s. 4½d. on Tuesday. Others in this section were virtually ignored, but Selection Trust jumped 6s. 10½d. to 85s. on Monday before reacting to 84s. 4½d. in quieter trading on Tuesday; the only explanation offered for the sudden move, which was apparently not U.S. inspired, was that the buyers may have thought that Selection has a big holding in R.S.T. This is a mistake which is often made, the company's interest in R.S.T. (and Roan) is merely an indirect one via the 12.4 per cent stake held in American Metal Climax.

Malayan tin shares, which had been depressed by the mounting crisis in Laos, brightened considerably when news of Russia's willingness for a truce and peaceful negotiations became known. Ayer Hitam which had fallen from 33s. to 30s. 9d. quickly climbed back to 33s. 3d. Tronoh recovered from 44s. 6d. to 45s. 3d. and Siamese, which had been a poor market at around 13s. 9d., soon perked up to 14s. 9d. when Singapore buyers reappeared.

CANADIAN URANIUM SURPRISE

What an astonishing thing the Canadian uranium revelation was! A contract for the supply of 12,000 s.tons of uranium oxide to the United Kingdom, in existence since 1957, due to be delivered between March 31, 1963, and December 31, 1966, yet only revealed rather by accident in March, 1961. The affair becomes even more astonishing when viewed in the light of the stretch-out revision in 1959 of the known contract for the supply of 10,500 s.tons to the U.S. and the U.K., a stretch-out of deliveries until the end of 1966 which brought great hardship to the uranium townships in Canada. Yet still the other contract was not revealed.

The revelation has brought a buzz of excitement to Canadian uranium shares such as Rio Algom, the big Rio Tinto group producer, Denison Mines and Gunnar Mines. But exactly how it will affect them is at present shrouded in mystery. For one thing the U.K. authorities want to re-negotiate the contract involving "major adjustments", which will almost certainly include a stretch-out arrangement. Secondly, the Canadian Government has not yet allocated the contract to the individual producing companies. Thirdly, its terms are as yet unknown.

The Canadians' great hope is, of course, that this second contract will be stretched out so that the mines can keep going with some degree of economic viability in the period 1966 to 1970 and so bridge the gap to the seventies when, rightly or wrongly, all uranium producers hope that atomic power will be expanding fast enough to wipe out the present over-supplies and lead to a profitable commercial market for the metal.

No chickens are being counted yet by Rio Tinto in London, but the background against which the company's 1960 dividend will be decided on April 13 is becoming increasingly favourable.

KONONGO AND BIBIANI

The meetings of Konongo and Bibiani were interesting for two different reasons. The latter is included in the Ghana Government's take-over bid, but Konongo was, a little mysteriously, left out although it ranks with Bibiani as largely a dying gold mine. In his speech Mr. Robert Annan says that the next two years are the vital ones for Konongo. During that time the current development programme, not entirely without hope, should enable a decision to be made whether the property has a "reasonable future" or whether "a policy of retreat should be adopted".

If the latter, then it will be hoped that the Ghana Government will either accept the situation, instead of reacting violently as it did with the Mines (Abandonment) Bill to the recent close-down decision by Amalgamated Banket, or will offer a fair price for the mine. Konongo 1s. shares stand at par. Holders should see their money back over the remaining life of the property with the chance of appreci-

ation if reef development did turn up anything really worth while.

At the Bibiani meeting Major-General Sir Edward L. Spears was quite emphatic about the fairness of the 4s. per 4s. share bid by the Ghana Government which closes on April 12. By this means, he said, holders would get their money in full now instead of having to wait several years; although the book value of liquid assets was £550,000 against the £500,000 represented by the bid, £400,000 of this represents stores and plant at cost with a doubtful realizable value; finally, Sir Edward is quite sure that no private company would pay more than £500,000 for a mine with such limited prospects as Bibiani.

CHARTERED'S CANADIAN INVESTMENTS

At the recent meeting of the British South Africa Company the chairman, Lord Robins, gave further details of the new land-development investment in British Columbia. It is planned to develop a garden city near New Westminster, about 15 miles from Vancouver.

Chartered have joined forces with the Grosvenor-Laing Group in order to proceed with the development plan on a partnership basis. The scheme is to develop a garden city with a shopping centre, residential and business sections and other conventional amenities. Approximately 140 acres have been purchased and it is expected that Chartered's investment will amount, in total, to between $6,000,000 an $7,000,000 of which the initial outlay is in the order of $1,000,000.

In spite of the large net cash generation during the year, the intense activity in making new investments has reduced the net current assets to £1,416,000. This is less than the total of outstanding commitments at £1,928,000, excluding the group's share in this Canadian venture and the Australian bauxite project. However, it is unlikely that any considerable expenditure in Canada will have to be met before 1963 and there is no reason to suppose that it cannot be financed in the normal way, through retentions from profits, without entailing any major variation in the dividend policy.

It is this Canadian investment and the Australian bauxite venture that have given rise to considerable criticism, from Rhodesia, of Chartered's investment policy. However, as at March 1, 1961, over 55 per cent of the book value of the portfolio was invested in the Federation, excluding the group's expenditure on prospecting which amounts annually to approximately £1,500,000. By comparison the group's investments in Canada and Australia stood at 6.4 per cent and 1.5 per cent respectively. The group's second largest field is South Africa where investments held either directly or through Rand Selection, amount to £13,159,000 or 24.7 per cent.

RUMOURS LIFT RHODESIAN COPPERS

During the past week all the Rhodesian coppers advanced by over 4 per cent. Led by lively dealings on Wall Street, Rhodesian Selection Trust advanced to 11s. but eased again to close at the weekend at 10s. 9d. Rhokana reached 45s. 6d. but similarly eased again to close at 44s. 6d. These gains, mostly initiated in Wall Street, are the result of rumours which concern the copper market itself. It is being suggested in the U.S. that the African producers have made some new arrangements for the stabilization of the international market. How well founded these rumours are can only be shown by time and the first indication that can be expected is from Sir Ronald Prain at the informal meeting of R.S.T. shareholders on April 6, 1961.

If there is any truth in these rumours, it is not surprising that the Rhodesians should advance, for they are certainly the best equipped to operate under restricted conditions. Much has been said in the past about the iniquities of the "Copper bonus" scheme but it certainly has advantages. During high profitability periods, employees share in these profits and are restrained from making demands that become unreasonable during periods of production cuts. This is an advantage that the American producers do not share and thus their position is somewhat weaker.

LONRHO'S PROFITS

With reference to the note which appeared in our last week's issue, p. 345, it should be added that Lonrho's financial year for the period ended September 30,

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1959, was in fact a 15 month period, due to a change in year end and thus comparisons between that year and the 12 month period ended September 30, 1960, are possibly confusing. The average monthly profits during 1960 were £5,540 as compared with the previous period at £5,608. The actual fall in profits comparing the two years on a 12 month basis was only £810.

GOOD OUTLOOK FOR GENERAL TIN

The £1 shares of General Tin Investments were first quoted on the London Stock Exchange last May owing to the increasing U.K. interest therein. Their introduction was timely in view of the growing investment demand for tin shares, particularly marked since outputs were de-restricted under the International Tin Agreement last October. General Tin made a third, in the shares of holding companies, which give a spread over the general tin field.

It does not, however, have a widespread portfolio of shares in actual tin-mining companies, but holds its stake, "the major part of the company's resources", in the industry through large investments in British Tin Investment and Consolidated Tin Smelters together with a smaller holding in London Tin Corporation. British Tin and London Tin, although having quite considerable interests outside tin, have the major part of their investments in actual producing concerns while Consolidated Tin is one of the biggest tin smelting companies.

Here then is the background to General Tin, which in 1960 made a consolidated net profit of £239,887 against £209,067 and which stepped its dividend up from 12 to 14 per cent, a payment that absorbed £185,220. In their annual statement the Board, of which Mr. C. F. Geddes is the chairman with Mr. Antenor Patino as president, say that no tin shares have been sold during the year, but the small shareholdings in South and Central Africa have been eliminated.

The company has subscribed at a cost of £145,670 for 100,000 new shares in Patino of Canada, which has interests in copper and asbestos production in that country, together with a considerable portfolio of investments in American and Canadian companies. Three members of the General Tin Board are directors of Patino of Canada.

General Tin £1 shares are 48s. to yield just under 6 per cent. This is not at the moment a very exciting return, but it has to be remembered that because it holds its stake in the tin industry mainly through other holding companies, which always themselves have a time lag in the receipt of dividends from rising prosperity in the industry, General Tin has what may be termed a double time lag. This should lead to a considerable build-up of revenue in 1961. The directors content themselves with the modest statement that "it is expected, in the absence of unforeseen circumstances, that the company should receive a larger income from its tin shares than in 1960 and some small increase from the rest of the list".

VENTURES' CONSOLIDATION

In the annual report of the McIntyre Porcupine Mines for the year ended December 31, 1960, it has been announced that McIntyre's holding in Ventures Limited has been increased by 70,000 shares and now stands at 25.66 per cent. Ventures has been going through a programme of consolidation, the greater part of which is now completed. Giant Yellowknife Gold Mines and Cons. Sudbury Basin Mines have been merged and Ventures have purchased most of the assets of Hoyle Mining and of Frobisher Limited. These reorganizations should ultimately enhance the earnings of McIntyre through its holding in Ventures.

The market value of McIntyre's portfolio has increased from last year and amounted to $81,480,410 as at December 31. Together with an excess of current assets over liabilities of over $1,000,000 this gives a net asset value of $35.99 per share.

The mining operations of McIntyre Porcupine add very little to the net profit of the company even though a government subsidy of over $1,000,000 has been received. However it should be mentioned that the production of silver and cobalt from the Castle division was a record and resulted in a net profit of $339,439. The company has continued its vigorous exploration policy throughout the year, though no orebodies of an economic size were located.

SHERRITT GORDON MINES

Mainly as a result of a reduction in operating costs and an increase in the volume of custom treatment business, the net profit of Sherritt Gordon for the year ended December 31, 1960, has increased from $2,370,000 to $3,752,000. This increase in the profit level has permitted the resumption of dividend payments after an interval of fourteen years. A dividend of 25 c. per share has been declared. Generally, the prospects of the company are now far more encouraging than they have been for some years. Not only have better values been located at depth in the Lake Lynn mine but the Fort Saskatchewan plant has been made less dependent upon this mine. Also outlets have been developed for the sale of specialized forms of nickel and cobalt.

Applications are invited for the position of Mine Surveyor, at the Weardale Lead Co., Co. Durham. Salary commensurate with qualifications and experience.

Applications stating age, marital status, experience, etc., to the

Manager,
The Weardale Lead Co. Ltd.,
Rookhope,
Bishop Auckland,
Co. Durham.

The Proprietors of British Patent No. 754,983 for "FERRULE-DRILL CROWN", desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57-58 Lincoln's Inn Fields, London, W.C.2.

KONONGO GOLD

MR. ROBERT ANNAN'S REVIEW

The twenty-seventh annual general meeting of Konongo Gold Mines, Ltd. was held on March 28 in London.

Mr. Robert Annan, M.I.M.M., Chairman, presided and in the course of his speech said :—

Operations for the year ended September 30, 1960, continued the trend of previous years in which declining grade of the ore was only offset in part by an increase in the tonnage treated. As a result there remains a net profit for the year of £55,730, out of which the interim dividend of one penny per share paid last September absorbed £17,875. Your Directors now recommend a final dividend of two pence per share.

The proved ore reserves at September 30, 1960, amounted to 155,290 tons averaging 13.5 dwt., a decrease of 7,725 tons and an increase of 0.5 dwt. in value. In addition pillars are estimated to contain 22,880 tons of recoverable ore assaying 17.6 dwt.

With ore reserves of barely two years' supply at the present rate of treatment, the results of development are of critical importance to the future of the mine. The geology of the Konongo Mine is complicated and not easy to describe in non-technical terms. It has been the subject of careful study and of periodical reports by specialists throughout the history of the mine. The main orebodies worked up till now have been contained within the well defined fissure zones which pass through the property. The known occurrences of this type have been exhausted or are approaching exhaustion. Search for others continues by all available means but the area remaining untested is being steadily reduced.

More recently, members will have noticed reports of orebodies in the walls of the main fissure in the Boabedroo Section. It has now been established that the wall rocks have been subjected to intense folding and that the folds may enclose orebodies of irregular shape, size and value. Nine of such orebodies have been located so far. Two have already been worked out and four have proved of minor importance. The remaining three are still being developed and might possibly yield a total of 250,000 tons of ore at 10 dwt. or better. This, of course, is still subject to proof. The important point is that these fold-controlled bodies appear to be part of a regional pattern and that others may exist in other parts of the property accessible from existing workings. This work is being followed up vigorously and the next two years should show whether the property has a reasonable future or whether a policy of retreat should be adopted.

Our Company was not affected by the Government's Mines (Abandonment) Bill which proposed severe penalties on mines closing down without official consent. This Bill is to be withdrawn, subject to the success of an offer which Government has made to purchase the entire capital of five of the seven producing gold mines in the country. We were not included in this offer and no approach was made to us at any stage of the negotiations, but these events have obvious implications for us unless our development continues to be successful and we shall watch the situation with care.

The report and accounts were adopted.

BOOK REVIEWS

Ultraviolet Guide to Minerals *by Sterling Gleason. D. Van Nostrand Co., Ltd., London. Price 52s. 6d.*

A limited number of mineral species invariably fluoresce when irradiated with ultraviolet light, whilst many others may or may not do so. Certain others, which never fluoresce, may yield, by simple chemical treatment, products which fluoresce characteristically and so facilitate identification of the parent mineral. Consequently all who are concerned with mineral recognition are particularly interested in the fluorescence of minerals—particularly because suitable ultraviolet lamps are comparatively cheap and readily transportable; yet mineralogical text-books have largely neglected this subject.

The American author, who was for a long time a correspondent of *Popular Science Monthly*, has sought to fill this gap in the literature and, for the most part, has succeeded admirably.

Although certain chapters are written specifically for the beginner, others for the advanced mineral collector, the mineral dresser, prospector and miner, the whole is written in a popular science style and so virtually anyone can understand the entire text without undue difficulty. The adoption of this particular style has resulted in a somewhat naive presentation of some of the material which may not be particularly pleasing to all trained scientists. It is, for example, a little unexpected, yet perhaps, refreshing—to read (p.142) that in tin-bearing deposits "discovery of mercury or antimony would be as startling as seeing a Harvard sweater in a Yale rooting section", and in connection with the development of contact metamorphic deposits (p.143) that "sizzling intruders often enrich the contact zone with entirely new ore minerals". Because the author was over-zealous in his desire to ensure that all who read his book should understand it, he has often used "weight" when he meant "density" and has made certain statements which are meaningless. Thus, in describing the appearance of cuproscheelite (p.56) he says it "looks like stone, not metallic" and that "it looks like quartz, but softer; twice as heavy". On page 49 he remarks that tourmaline "fractures like coal". It is also frustrating to find that though the results of many named workers are discussed these are often not supported by references.

Despite the above criticisms the book has much to recommend it. The series of mineral identification tables—in which fluorescent characteristics naturally play a dominant role—are of considerable merit. In addition, all the important mineral recognition tests which depend on the use of ultraviolet light are described in considerable detail. These include a number which are extremely useful, but are not widely known. Amongst these there is an exceedingly simple test for identifying grains of monazite in a composite sample and another which enables rapid differentiation to be made between barite and celestite.

The text is remarkably free from errors, though in the reviewer's opinion, the suggestion that diagnostic fluorescent products can be generally obtained by fusing the complex uranium-bearing species with sodium fluoride is incorrect.

The illustrations, both coloured and black-and-white are excellent and enhance the value of the work despite the fact that some have appeared elsewhere in the literature.

Despite certain imperfections the book has a great deal to offer to all who are interested in the present and future applications of ultraviolet light to the identification of minerals and a fuller idea of its contents may be gleaned from its section and chapter headings.

K.F.G.H.

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The Diamond Industry in 1958-1959, *by A. Moyar. Vlaams Economisch Verbond, Schoenmarkt 31/VII (Tower Building), Antwerp. Price 14s. 4d. or $2.00 post free.*

In his annual survey of the diamond industry M. Moyar has been able to report, for the ninth year in succession, a record figure for world production which, for 1958, is placed at about 28,041,052 ct., or 7.67 per cent more than in 1957. Production in 1959, however, is estimated to have been in the region of 26,600,000 ct., representing a drop of about 1,400,000 ct. or 5 per cent.

Though the survey is concerned essentially with the period indicated by the title, reference is made to a number of major developments of later date, such as the agreement announced in January, 1960, and recently renewed whereunder all diamonds produced in Russia and exported to the West are purchased by the Diamond Corporation and sold through the Central Sales Organization of the De Beers group. As Moyar points out, this doubtless concerns only gemstones, industrial stones being essential to Soviet industry. The present requirements of the U.S.S.R. for industrial diamonds are estimated to be in the region of 5,000,000 ct. per annum, and will increase pro rata to the progress of industrialization. The U.S.S.R. continues to purchase industrial diamonds on the world markets and there are indications that she is also supplied by certain African producing countries. The commercial agreement concluded in February, 1959, with Guinea envisages the supply of industrial diamonds to the U.S.S.R.

The aim of the 1959-1965 seven-year plan is to enable the Soviet Union to become self-sufficient as regards diamonds. In order to realise this aim, a considerable mining industry will have to be established.

For a quarter of a century the Congo has been the largest producer in the world, by volume, of diamonds. Unless anything happens to mar the progress of exploitation, comments M. Moyar, the enormous reserves of the Lubilash deposits will ensure that it remains so for the next quarter of a century. It is noted, however, that at the time of going to press mining operations had ceased momentarily at both Tshikapa and Bakwanga, but that work was to be resumed in the Bakwanga mines as soon as orderly conditions had been restored (these mines are again in operation).

The survey of production by countries is followed by sections on trade, the diamond cutting industry, and industrial diamonds, together with summaries of developments in the diamond tool industry and in the production of synthetic diamonds.

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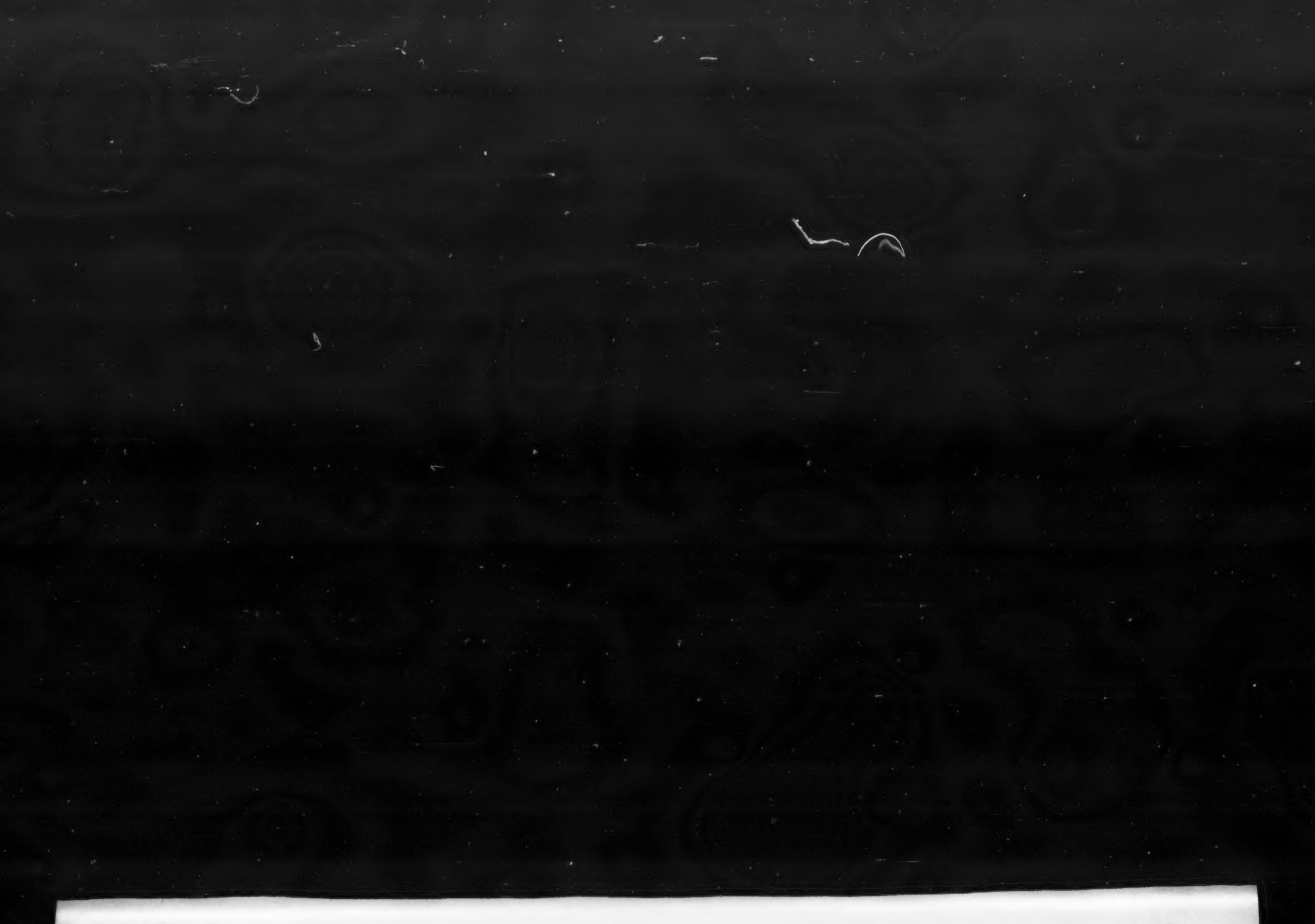
Fuel Research 1917-1958, *published for DSIR by H.M.S.O. pp. 120. Price 15s. 0d. ($2.70 U.S.A.) by post 15s. 8d.*

In 1917 the Department of Scientific and Industrial Research appointed a Fuel Research Board "to investigate in the broad national interest the nature, preparation, utilization and treatment of coals and other fuels, and of products derived from fuels".

In the following year the Fuel Research Station was established at Greenwich. Some forty years later, in 1958, the Research Council considered that, in view of many developments in the fuel world, the Fuel Research Station had completed its work and should close down. The achievements of the Fuel Research Station are summarized in this publication.

The main sections deal with basic aspects of fuel research including fuel analysis, carbonization, preparation of coal for the market, gasification of coal and coke, coal constitution, combustion and steam raising, hydrogenation of coal and coal tar, the Fischer-Tropsch synthesis, atmospheric pollution, and domestic heating.

All of this provided the main basis of the Station's research throughout its existence but priorities altered continuously to meet changing needs. During the 1939-45 war the emphasis naturally changed radically and it is a striking measure of the versatility of the Station that it became deeply involved in such activities as camouflage by smoke and coal dust, production of flame thrower fuels and other incendiaries, mobile producer-gas units, and the use of liquid methane as a fuel for motor vehicles.

The Fuel Research Board undertook the responsibility of making a systematic survey of the physical and chemical characteristics of the coal seams as they occur below ground and of the graded products as they are made available to consumers. To achieve this, separate administrative laboratories were established in the main coalfields. The results for individual coal fields were published in some 60 papers. Opportunity was taken in 1946 to apply the survey data on a national scale. The Coal Survey organization was transferred to the National Coal Board in 1947 on terms that provided for its identity to be maintained and its basic task of evaluating the national coal resources to be continued.

The review presents in summary form information which might otherwise be difficult to locate, and includes 151 references to the papers of the Station.